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TRIGONOMETRIC PARALLAXES OF STARS OF A AND B TYPES

By S. A. Mitchell

In these Publications for February, 1922, Curtis makes the following remarks:

> "More direct parallaxes are urgently needed for the stars of type A, and for stars of type B our knowledge, as far as direct parallax determinations are concerned, is practically zero. Does the slope of the progression in absolute magnitude as one goes towards the earlier types decrease somewhat, as seems slightly indicated for type A in the diagram, giving us B type stars averaging about + 1 in absolute magnitude, or does it rise without change so as to approach more nearly to absolute magnitude —1 for the B stars? The stars of this type form perhaps the most urgent, as well as the most difficult, field for direct parallax determinations today, particularly as the spectroscopic method cannot as yet be applied to them."

Parallax observers by trigonometric methods, ever since 1838 when Bessel derived the parallax of 61 *Cygni*, have usually been more interested in obtaining *real* parallaxes, that is, values many times in excess of the probable error. This was well enough for the earlier observers when the probable and systematic errors were very large, but today when parallaxes are determined by photography with large telescopes this desire for securing parallaxes large in size should be a thing of the past. Again to quote from Curtis,

> As for the stars of types K and M, it would seem that our parallax programs are now really overloaded with faint stars of these types possessing large proper motions—a type of star of which our present knowledge seems reasonably complete.

The McCormick Observatory recognized some time ago that what is needed on parallax programs for testing theories of stellar evolution and also for furnishing material for studies is a series of stars of various magnitudes and spectral types, but most particularly the brighter stars, and most urgent of all, stars of A and B types. The McCormick observers also share in the general pleasure of deriving *real* parallaxes, but at the same time they feel that a zero or even a negative parallax of a bright star of early type is a far greater contribution to present day astronomy than the distance of a faint star of large proper motion which furnishes a large positive parallax.

Up to date the parallaxes of 19 B-type stars have been completed and also of 50 A-type stars. In addition the values for 22 Cepheids or pseudo-Cepheids have been derived as well as the parallaxes of 49 stars brighter than magnitude 3.0. In the subjoined table the values of parallaxes and derived absolute magnitudes are given. The parallaxes are relative to the particular set of comparison stars chosen. To derive the absolute parallaxes 0″.005 should be added to the relative values. In calculating absolute magnitudes it was assumed that stars in the accompanying list with negative parallaxes had a relative parallax of 0″.000. This method of procedure may possibly change slightly the means of the absolute magnitudes towards positive values, but this change will probably not amount to more than one-tenth of a magnitude.

The star o^2 *Eridani* B, of absolute magnitude +11.4, is an exceptional star. Its spectrum is classified as A by the Draper Catalogue, as A0 by Adams and B9 by Leonard. This star is omitted from the means below. As expected, the parallax for the B stars is small, the average relative parallax for the 19 stars being +0″.010. The averages of the absolute magnitudes of the different classes are:

Spectral Class	No.	Abs. Magn.
B0 to B5	12	—1.7
B8 and B9	7	+0.3
A0 to A3	36	+0.6
A5 to A8	13	+2.2
All B's	19	—0.9
All A's	49	+1.0

A TYPE STARS

Star	α 1900	δ 1900	Mag. and Spect.	Parallax Relative	Abs. Mag.
W. B. 3^h 147 . . .	3^h 11^m	— 6° 17′	6.0 Bg	+″.033∓″.007	+3.9
δ Persei	3 35	+47 28	3.1 B5	+ .001∓ .011	—3.0
ε Persei	3 51	+39 43	3.0 B1	— .013∓ .011	—3.5
π^4 Orionis	4 45	+ 5 26	3.8 B3	+ .001∓ .008	—2.3
η Aurigæ	4 59	+41 6	3.3 B3	+ .012∓ .008	—0.5
γ Orionis	5 19	+ 6 15	1.7 B2	+ .024∓ .007	—1.0
β Can. Maj.	6 18	—17 54	1.9 B1	+ .007∓ .010	—2.7

β Can. Min.	7 21	+ 8 29	3.1 B8	+ .017∓ .012	—0.2
α Leonis	10 3	+12 27	1.3 B8	+ .059∓ .013	+0.3
o Leonis	10 27	+ 9 49	3.8 B0p	+ .034∓ .009	+ 1.8
κ Draconis	12 29	+70 20	3.9 B5p	— .007∓ .008	—2.6
ν Scorpii AB	16 6	—19 12	4.3 B3	+ .010∓ .010	+0.3
λ Aquilæ	19 0	— 5 2	3.6 B9	+ .034∓ .009	+1.6
Aquilæ 59 Ft.	19 8	+16 41	6.4 B9	— .004∓ .008	—0.1
β^2 Cygni	19 26	+27 45	5.4 B0	.000∓ .006	—1.1
β^2 Capricorni	20 15	—15 6	6.2 B9	.000∓ .010	—0.4
ε Delphini	20 28	+10 57	4.0 B5	— .009∓ .008	—2.5
ζ Pegasi	22 36	+10 18	3.6 B8	— .006∓ .014	—2.9
o Androm	22 57	+41 47	3.6 B3	— .001∓ .010	—2.9

B TYPE STARS

Star	α 1900	δ 1900	Mag. and Spect.	Parallax Relative	Abs. Mag.
φ Cassiop	1^h 5^m	+54° 37′	4.5 A5	+″.047∓″.013	+3.1
β Arietis	1 49	+20 19	2.7 A5	+ .091∓ .012	+2.6
γ^2 Androm	1 57	+41 51	5.1 A0	+ .022∓ .014	+2.3
β Trianguli	2 3	+34 30	3.1 A5	+ .016∓ .008	—0.3
γ Ceti	2 38	+ 2 49	3.6 A2	+ .037∓ .008	+1.7
16 Persei	2 44	+37 55	4.3 A8	+ .016∓ .010	+0.9
32 Eridani Ft.	3 49	— 3 14	6.3 A0	— .009∓ .009	—0.2
A. G. Berlin 1366	4 8	+22 6	9.1 A8	— .016∓ .009	+2.6
B. D. + 21° 608	4 8	+22 2	9.1 A8	— .023∓ .010	+2.6
o^2 40 Eridani B	4 10	— 7 48	9.7 A0	+ .214∓ .008	[+11.4]
ξ Eridani	4 18	— 3 58	5.2 A2	+ .010∓ .009	+0.9
A. G. Leip 1819	4 44	+ 6 48	7.1 A2	— .002∓ .015	+0.5
B Aurigæ	5 52	+44 56	2.1 A0p	+ .026∓ .009	—0.4
2 Lyncis	6 10	+59 2	4.4 A0	+ .021∓ .011	+1.5
Sirius	6 40	—16 35	—1.6 A0	+ .354∓ .008	+1.1
α^1 Gemini	7 28	+32 6	2.9 A0	+ .086∓ .007	+2.1
α^2 Gemini	7 28	+32 6	1.9 A0	+ .067∓ .010	+1.3
30 Hydræ	8 20	— 3 35	4.0 A0	+ .006∓ .011	—0.8
ι Cancri Ft.	8 40	+29 7	6.6 A5	+ .031∓ .006	+4.4
38 Lyncis	9 12	+37 13	3.8 A2	+ .039∓ .010	+2.0
δ Leonis	11 8	+21 4	2.6 A3	+ .073∓ .008	+2.1
γ Crateris	11 19	—17 8	4.1 A5	+ .025∓ .011	+1.5
γ Urs. Maj.	11 48	+54 14	2.5 A0	— .002∓ .007	—4.0
δ Corvi	12 24	—15 57	3.1 A0	— .007∓ .007	—3.4
θ Virginis	13 4	— 5 0	4.4 A0	+ .006∓ .006	—0.4
ζ^1 Urs. Maj.	13 19	+55 26	2.4 A2p	+ .046∓ .010	+0.9
ζ^2 Urs. Maj.	13 19	+55 26	3.9 A2	+ .017∓ .009	+0.7
g Urs. Maj.	13 21	+55 30	4.0 A5	+ .029∓ .009	+1.7
o Virginis	13 29	+ 4 10	4.9 A2p	+ .023∓ .010	+2.1
α Cor. Bor.	15 30	+27 3	2.3 A0	+ .056∓ .010	+1.2
β Serpentis	15 41	+15 44	3.7 A2	+ .029∓ .008	+1.4

ν Scorpii C.D. . .	16	6	—19	12	6.5	A0	+	.042∓ .015	+4.9
λ Ophiuchi	16	25	+ 2	12	3.9	A0	+	.009∓ .008	—0.6
δ Herculis	17	10	+24	57	3.2	A2	+	.016∓ .009	—0.2
α Ophiuchi	17	30	+12	38	2.1	A5	+	.042∓ .009	+0.5
Vega	18	33	+38	41	0.1	A0	+	.131∓ .006	+0.8
ζ Lyræ Bt.	18	41	+37	30	4.3	A3	+	.012∓ .007	+0.5
ζ Lyræ Ft.	18	41	+37	30	5.9	A3	+	.038∓ .010	+4.1
γ Lyræ	18	55	+32	33	3.3	A0p	+	.007∓ .009	—1.3
ζ Sagittarii	18	56	—30	1	2.7	A2	+	.018∓ .008	—0.5
ζ Aquilæ	19	1	+13	43	3.0	A0	+	.027∓ .010	+0.6
δ Cygni	19	41	+44	53	3.0	A0	+	.024∓ .013	+0.3
Altair	19	45	+ 8	36	0.89	A5	+	.218∓ .007	+2.7
o¹ Cygni	20	10	+46	30	4.9	A2	+	.022∓ .009	+2.2
R G Cam. 6487 . .	20	16	+55	5	6.0	A0	—	.021∓ .009	—0.5
ε Aquarii	20	42	— 9	51	3.8	A0	+	.018∓ .009	+0.6
α Cephei	21	16	+62	9	2.6	A5	+	.091∓ .008	+2.5
76 Cygni	21	37	+40	21	6.1	A0	+	.005∓ .012	+1.0
δ Capricorni . . .	21	41	—16	34	2.9	A5	+	.110∓ .012	+3.2
α Pegasi	22	59	+14	40	2.6	A0	+	.012∓ .011	—1.2

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